Product/Service Description Document
Winter Weather Probabilistic Experiment
Winter 2021-2022
Updated December 2021

Part I - Mission Connection

a. Product/Service Description – Experimental probabilistic storm total snowfall graphics will be posted to the web indicating the official snowfall forecast as well as probabilities for low and high end amounts based on the Weather Prediction Center (WPC) ensembles. Graphics and a table showing the probability of exceeding various snowfall thresholds such as ≥ 0.1", 1", 2", 4", 6", 8", 12", 18"; are also included.

b. Product Type – Experimental

c. Purpose - The purpose of these experimental probabilistic internet-based snowfall products is to provide customers and partners a range of snowfall possibilities, better communicate forecast uncertainty, and enhance Impact-based Decision Support Services (IDSS) during winter weather events. The probabilistic snowfall products will complement existing NWS deterministic snowfall graphics, indicating areas of low and/or high uncertainty. The offices involved will produce 10% and 90% exceedance percentile graphics represented as the "Low End Amount - 9 in 10 Chance (90%) of Higher Snowfall" and "High End Amount - 1 in 10 Chance (10%) of Higher Snowfall" along with an "Official Forecast Amount." Winter weather coordination calls with partners and customers frequently involve requests regarding forecast uncertainty, forecaster confidence, and best/worst case scenarios. These experimental probabilistic snowfall products will convey this critical information and enhance DSS. These probabilistic products were initially introduced to the Weather Forecast Office (WFO) Washington DC/Baltimore emergency management community during the winter of 2012/2013 with overwhelmingly favorable feedback. Additional expansion has occurred each winter since, and during 2018/2019, 2019/2020, and 2020/2021, a total of 90 WFOs in all four CONUS regions participated with 77 offices displaying the images on their websites and using them externally in partner briefings and social media. The experiment will continue during the 2021/2022 winter season while requirements are identified for operational transition with eventual implementation at all applicable offices. There are no changes to the experiment for the 2021-2022 season.

d. Audience - The target audiences for this experimental product are customers and partners such as emergency managers, state and local officials including School Superintendents, Department of Transportation (DOT), media and the general public. The forecast offices involved for the 2021-22 winter experiment include: Aberdeen, SD, Albany, NY, Albuquerque, NM, Amarillo, TX, Atlanta, GA, Baltimore, MD-Washington, DC, Billings, MT, Binghamton, NY, Bismarck, ND, Blacksburg, VA, Boulder, CO, Buffalo, NY, Burlington, VT, Caribou, ME, Charleston, SC, Charleston, WV, Cheyenne, WY, Chicago, IL, Cleveland, OH, Columbia, SC, Detroit, MI, Des Moines, IA, Dodge City, KS, Duluth, MN, Eastern North Dakota, Elko, NV, Flagstaff, AZ, Gaylord, MI, Glasgow, MT, Goodland, KS, Grand Junction, CO, Grand Rapids, MI, Gray, ME,

Great Falls, MT, Green Bay, WI, Greenville/Spartanburg, SC, Hanford, CA, Hastings, NE, Indianapolis, IN, Jackson, KY, Jackson, MS, Kansas City, MO, LaCrosse, WI, Lincoln, IL, Louisville, KY, Lubbock, TX, Marquette, MI, Medford, OR, Midland, TX, Milwaukee, WI, Minneapolis, MN, Missoula, MT, Morristown, TN, Mt. Holly, NJ, Nashville, TN, Newport/Morehead City, NC, New York, NY, Norman, OK, North Platte, NE, Northern Indiana, Omaha/Valley NE, Paducah, KY, Pendleton, OR, Pittsburgh, PA, Pocatello, ID, Pueblo, CO, Raleigh, NC, Rapid City, SD, Reno, NV, Riverton, WY, Sacramento, CA, Salt Lake City, UT, San Angelo, TX, San Diego, CA, Seattle, WA, Shreveport, LA, Sioux Falls, SD, Spokane, WA, Springfield, MO, St. Louis, MO, State College, PA, Boston/Norton, MA, Topeka, KS, Tulsa, OK, Quad Cities IA/IL, Wakefield, VA, Wichita, KS, Wilmington, NC, Wilmington, OH.

The following offices will display the data on their web pages:

Aberdeen, SD:	https://www.weather.gov/abr/winter
Albany, NY:	https://www.weather.gov/aly/winter
Albuquerque, NM:	https://www.weather.gov/abq/winter
Amarillo, TX:	https://www.weather.gov/ama/winter
Atlanta, GA:	https://www.weather.gov/ffc/winter`
Baltimore, MD-Washington, DC:	https://www.weather.gov/lwx/winter
Binghamton, NY:	https://www.weather.gov/bgm/winter
Bismarck, ND:	https://www.weather.gov/bis/winter
Blacksburg, VA:	https://www.weather.gov/rnk/winter
Boston/Norton, MA:	https://www.weather.gov/box/winter
Boulder, CO:	https://www.weather.gov/bou/winter
Buffalo, NY:	https://www.weather.gov/buf/winter
Burlington, VT:	https://www.weather.gov/btv/winter
Caribou, ME:	https://www.weather.gov/car/winter
Charleston, SC:	https://www.weather.gov/chs/winter
Charleston, WV:	https://www.weather.gov/rlx/winter
Cheyenne, WY:	https://www.weather.gov/cys/winter
Chicago, IL:	https://www.weather.gov/lot/winter
Cleveland, OH:	https://www.weather.gov/cle/winter
Columbia, SC:	https://www.weather.gov/cae/winter
Detroit, MI:	https://www.weather.gov/dtx/winter
Des Moines, IA:	https://www.weather.gov/dmx/winter
Dodge City, KS:	https://www.weather.gov/ddc/winter
Duluth, MN:	https://www.weather.gov/dlh/winter
Eastern North Dakota:	https://www.weather.gov/fgf/winter
Elko, NV:	https://www.weather.gov/lkn/winter
Fort Worth/Dallas, TX:	https://www.weather.gov/fwd/winter
Gaylord, MI:	https://www.weather.gov/apx/winter
Glasgow, MT:	https://www.weather.gov/ggw/winter
Goodland, KS:	https://www.weather.gov/gld/winter
Grand Junction, CO:	https://www.weather.gov/gjt/winter
Grand Rapids, MI:	https://www.weather.gov/grr/winter
Gray, ME:	https://www.weather.gov/gyx/winter
Great Falls, MT:	https://www.weather.gov/tfx/winter
Green Bay, WI:	https://www.weather.gov/grb/winter
Greenville/Spartanburg, SC:	https://www.weather.gov/gsp/winter
Hastings, NE:	https://www.weather.gov/gid/winter
Indianapolis, IN:	https://www.weather.gov/ind/winter
Jackson, KY:	https://www.weather.gov/jkl/winter

Kansas City, MO:	https://www.weather.gov/eax/winter
LaCrosse, WI:	https://www.weather.gov/arx/winter
Lincoln, IL:	https://www.weather.gov/ilx/winter
Louisville, KY:	https://www.weather.gov/lmk/winter
Lubbock, TX:	https://www.weather.gov/lub/winter
Marquette, MI:	https://www.weather.gov/mqt/winter
Medford, OR:	https://www.weather.gov/mfr/winter
Midland, TX:	https://www.weather.gov/maf/winter
Milwaukee, WI:	https://www.weather.gov/mkx/winter
Minneapolis, MN:	https://www.weather.gov/mpx/winter
Missoula, MT:	https://www.weather.gov/mso/winter
Mt. Holly, NJ:	https://www.weather.gov/phi/winter
Nashville, TN:	https://www.weather.gov/ohx/winter
New York, NY:	https://www.weather.gov/okx/winter
Newport/Morehead City, NC:	https://www.weather.gov/mhx/winter
Norman, OK:	https://www.weather.gov/oun/winter
North Platte, NE:	https://www.weather.gov/lbf/winter
Northern Indiana:	https://www.weather.gov/iwx/winter
Omaha/Valley, NE:	https://www.weather.gov/oax/winter
Paducah, KY:	https://www.weather.gov/pah/winter
Pittsburgh, PA:	https://www.weather.gov/pbz/winter
Pueblo, CO:	https://www.weather.gov/pub/winter
Quad Cities, IL:	https://www.weather.gov/dvn/winter
Raleigh, NC:	https://www.weather.gov/rah/winter
Rapid City, SD:	https://www.weather.gov/unr/winter
Reno, NV:	https://www.weather.gov/rev/winter
Riverton, WY:	https://www.weather.gov/riw/winter
Salt Lake City, UT:	https://www.weather.gov/slc/winter
St. Louis, MO:	https://www.weather.gov/lsx/winter
Sioux Falls, SD:	https://www.weather.gov/fsd/winter
Springfield, MO:	https://www.weather.gov/sgf/winter
State College, PA:	https://www.weather.gov/ctp/winter
Topeka, KS:	https://www.weather.gov/top/winter
Tulsa, OK:	https://www.weather.gov/tsa/winter
Wakefield, VA:	https://www.weather.gov/akq/winter
Wichita, KS:	https://www.weather.gov/ict/winter
Wilmington, NC:	https://www.weather.gov/ilm/winter
Wilmington, OH:	https://www.weather.gov/iln/winter

e. Presentation Format – The format for the first probabilistic snowfall graphic is: Low End Amount - 9 in 10 Chance (90%) of Higher Snowfall, Official Forecast, High End Amount - 1 in 10 Chance (10%) of Higher Snowfall. The second graphic shows snowfall threshold amounts with color curve probabilities from zero to 100 percent; the third product is a text-based table that shows the low end, official forecast, and high end snowfall amounts and exceedance probabilities for specific locations. Please see examples in Part II.

f. Feedback Method – Feedback on the proposal to implement these graphics at all applicable NWS offices will be gathered from representatives from federal, state, county, and local government agencies and broadcast media during scheduled customer review meetings and via a web-based survey linked to the product page:

https://www.surveymonkey.com/r/WinterWeatherProbabilisticExperiment2021-2022

The customer comment period runs through April 30, 2022.

Customer comments or questions on the Probabilistic Snowfall products may be addressed to:

Jeff Waldstreicher
National Weather Service (NWS) Eastern Region HQ
E-mail:jeff.waldstreicher@noaa.gov
Phone: 631-244-0131

Derek Deroche
National Weather Service (NWS) Central Region HQ
E-mail: Derek.Deroche@noaa.gov
Phone: 816-268-3154

Paul Witsaman
National Weather Service (NWS) Southern Region HQ
E-mail: paul.witsaman@noaa.gov
Phone: 682-703-3707x116

Claudia Bell
National Weather Service (NWS) Western Region HQ
E-mail: claudia.bell@noaa.gov
Phone: 801-524-4000x233

Sarah Perfater
National Weather Service (NWS) Headquarters
E-mail: sarah.perfater@noaa.gov
Phone: 301-427-9374

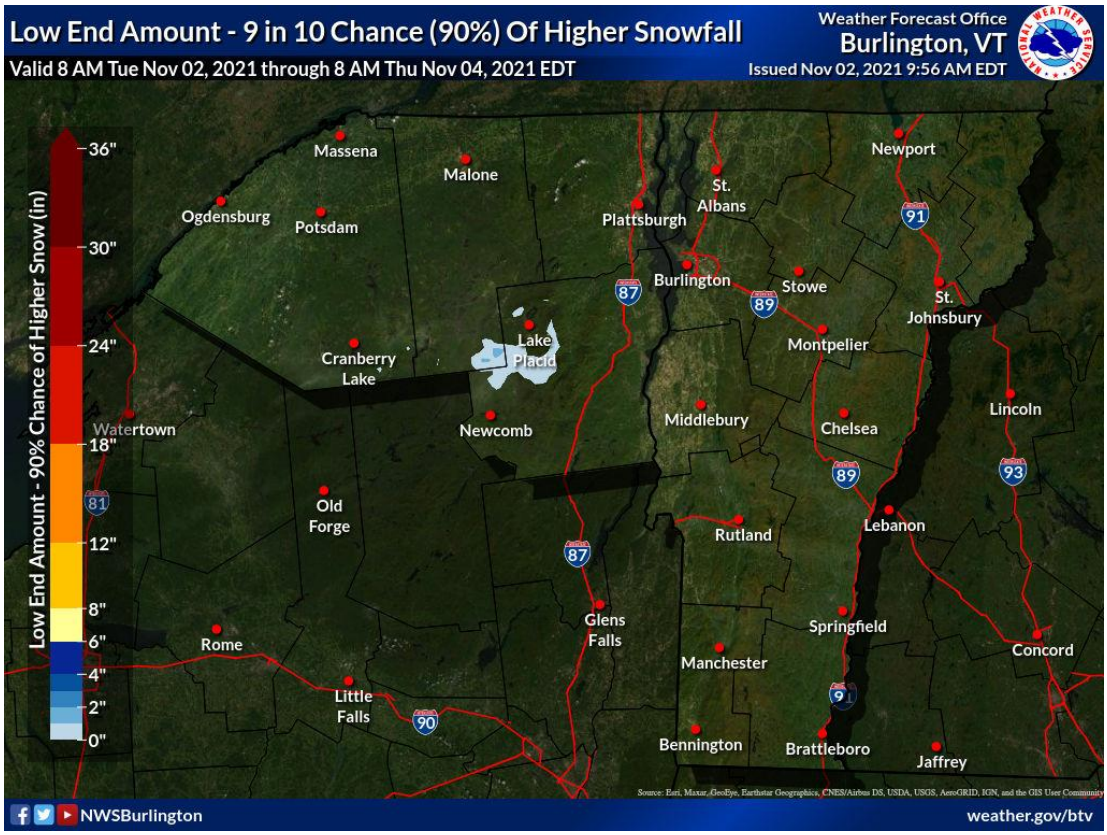
Part II – Technical Description

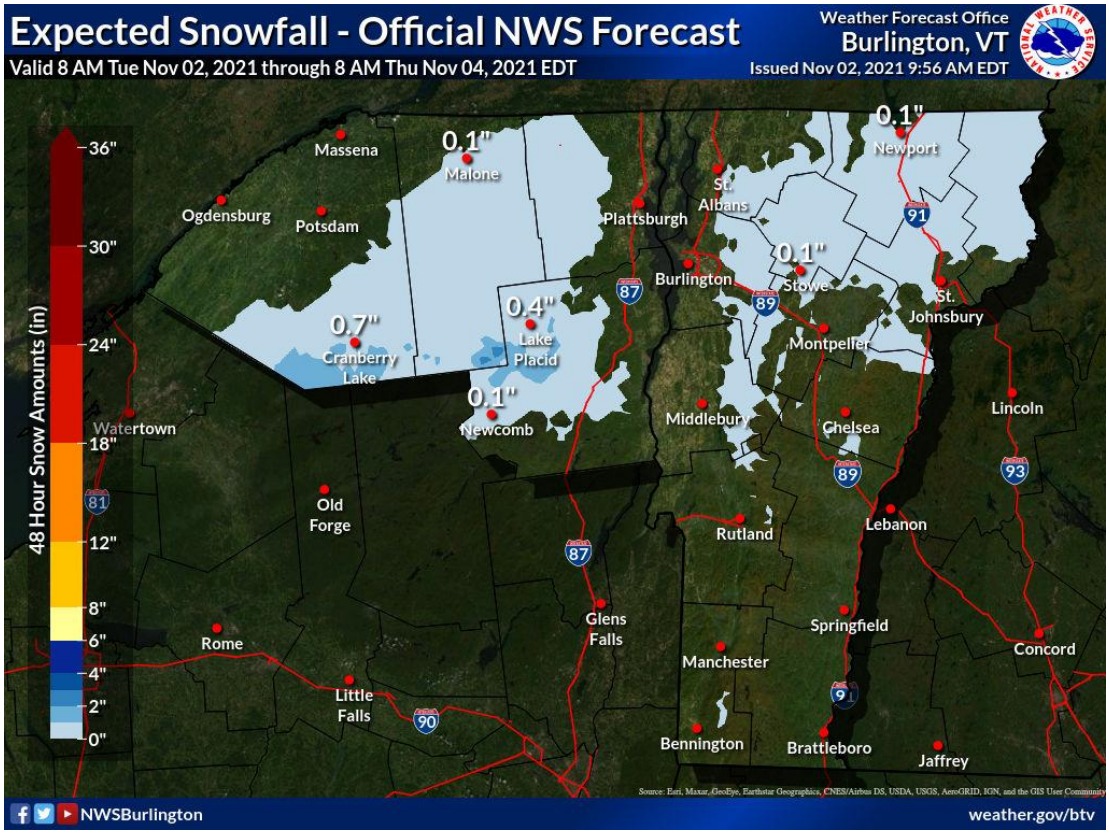
a. Format and Science Basis – The format is described in Part I under "Presentation Format." A 61 member multi-model ensemble will serve as the basis for computing the snowfall probabilities, with forecasters adjusting the most likely snowfall amount based on experience. This will create a probability density function (PDF) from which the 5th, 10th, 25th, 50th, 75th, 90th and 95th percentile snowfall amounts and probabilities of exceeding various threshold snowfall amounts will be derived.

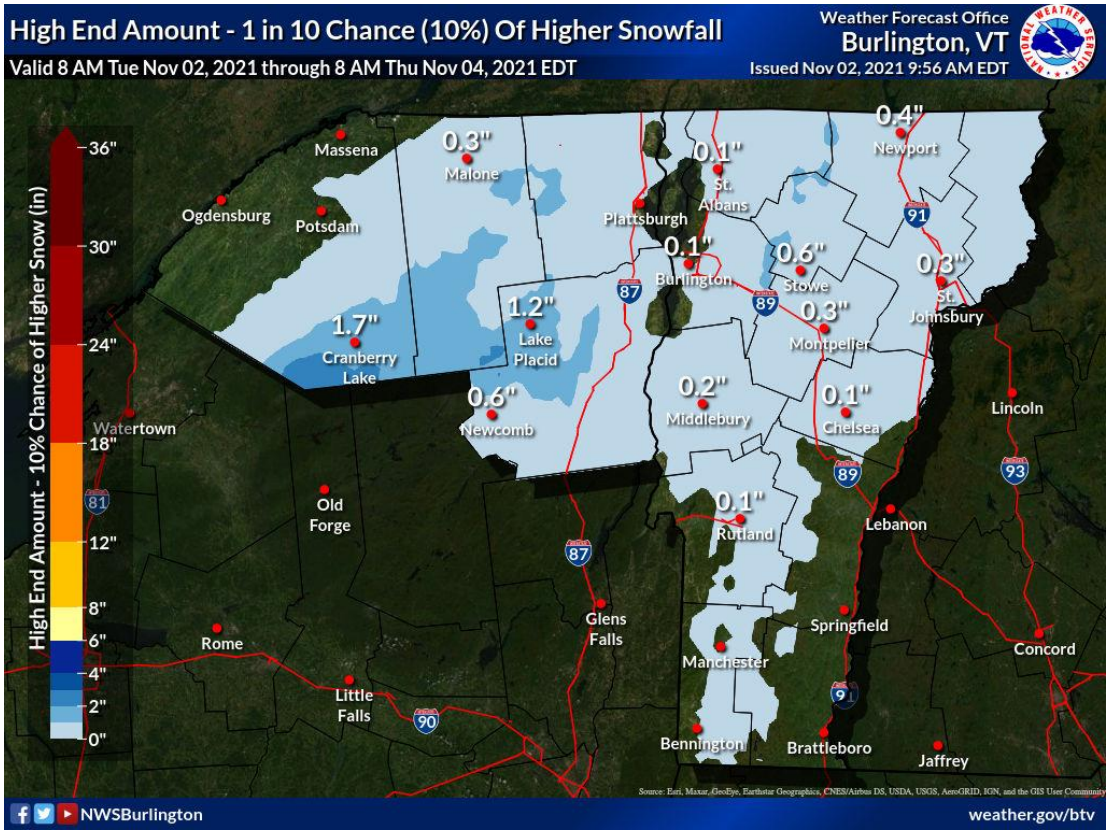
b. Availability – These products will be available at all times during the winter season.

Probabilistic Storm Total Snowfall Product examples:

1. The graphics below depict the Low End Amount, Expected Snowfall (Official Forecast), and High End Amount in Vermont and Northern New York for a particular event.


Low End Amount - 9 in 10 Chance (90%) Of Higher Snowfall
Valid 8 AM Tue Nov 02, 2021 through 8 AM Thu Nov 04, 2021 EDT
Weather Forecast Office
Burlington, VT
Issued Nov 02, 2021 9:56 AM EDT
Low End Amount - 90% Chance of Higher Snow (in)
36"
30"
24"
18"
12"
8"
6"
4"
2"
0"
Massena
Malone
Ogdensburg
Potsdam
Plattsburgh
St. Albans
Newport
Burlington
Stowe
St. Johnsbury
Montpelier
Cranberry Lake
Lake Placid
Watertown
Newcomb
Middlebury
Chelsea
Lincoln
Old Forge
Rutland
Lebanon
Glens Falls
Springfield
Rome
Manchester
Concord
Little Falls
Bennington
Brattleboro
Jaffrey
NWSBurlington
weather.gov/btv

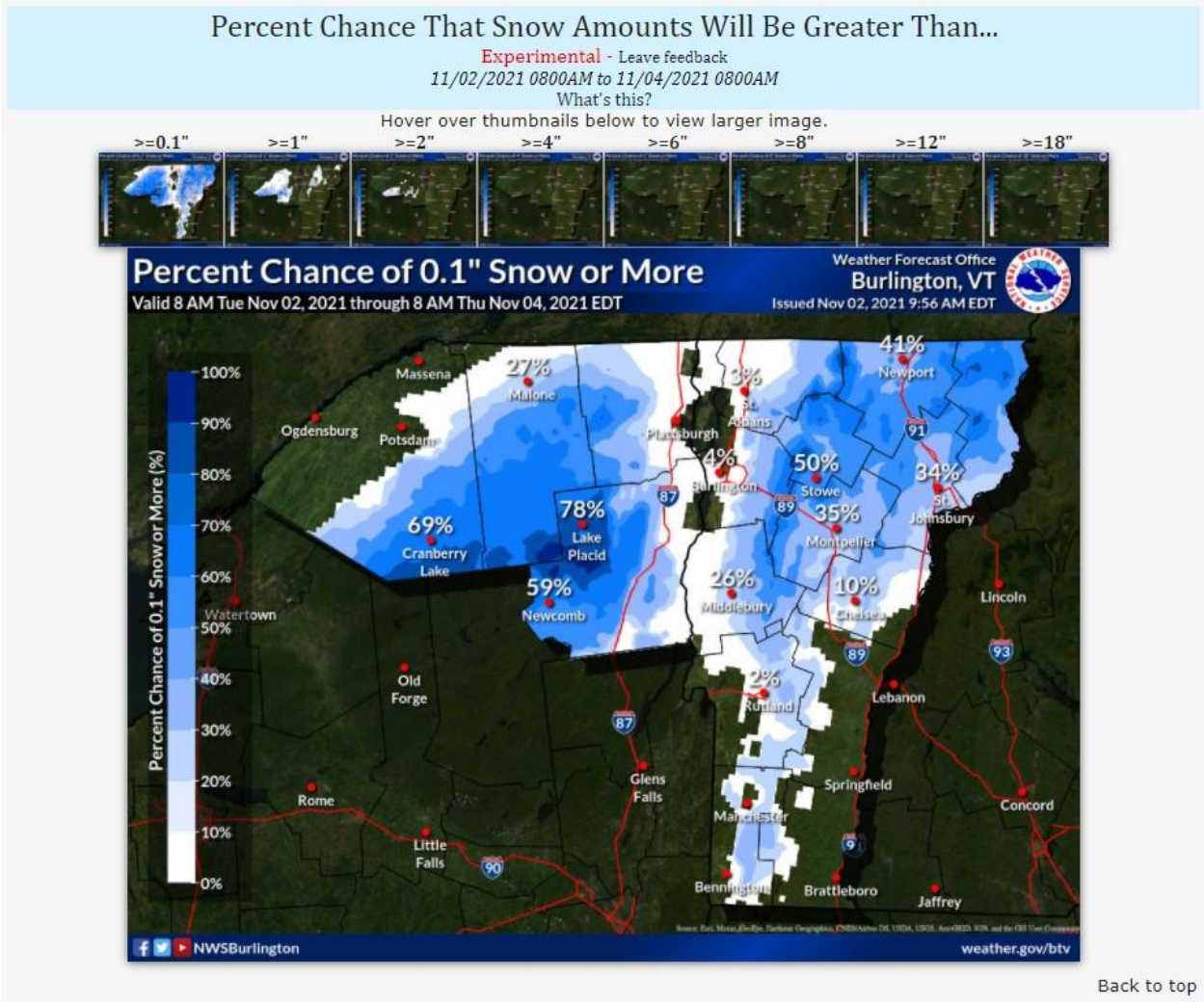

Expected Snowfall - Official NWS Forecast
Valid 8 AM Tue Nov 02, 2021 through 8 AM Thu Nov 04, 2021 EDT
Weather Forecast Office
Burlington, VT
Issued Nov 02, 2021 9:56 AM EDT
48 Hour Snow Amounts (in)
36"
30"
24"
18"
12"
8"
6"
4"
2"
0"
Massena
0.1"
Malone
Ogdensburg
Potsdam
Plattsburgh
St. Albans
0.1"
Newport
0.1"
Burlington
Stowe
St. Johnsbury
Montpelier
0.7"
Cranberry Lake
0.4"
Lake Placid
0.1"
Newcomb
Middlebury
Chelsea
Lincoln
Watertown
Old Forge
Rutland
Lebanon
Glens Falls
Springfield
Rome
Manchester
Concord
Little Falls
Bennington
Brattleboro
Jaffrey
NWSBurlington
weather.gov/btv


High End Amount - 1 in 10 Chance (10%) Of Higher Snowfall
Valid 8 AM Tue Nov 02, 2021 through 8 AM Thu Nov 04, 2021 EDT
Weather Forecast Office
Burlington, VT
Issued Nov 02, 2021 9:56 AM EDT
High End Amount - 10% Chance of Higher Snow (in)
36"
30"
24"
18"
12"
8"
6"
4"
2"
0"
Massena
0.3"
Malone
0.4"
Newport
Ogdensburg
Potsdam
Plattsburgh
0.1"
St. Albans
0.1"
Burlington
0.6"
Stowe
0.3"
St. Johnsbury
0.3"
Montpelier
1.2"
Lake Placid
1.7"
Cranberry Lake
0.6"
Newcomb
0.2"
Middlebury
0.1"
Chelsea
Lincoln
Watertown
Old Forge
0.1"
Rutland
Lebanon
Glens Falls
Springfield
Rome
Manchester
Concord
Little Falls
Bennington
Brattleboro
Jaffrey
NWSBurlington
weather.gov/btv

A description of each of these graphics will be available by clicking on the "What's this?" link below each graphic, which will display a pop-up window with the descriptive text for that graphic/section.

A wide range between the low end and high end snow amounts indicates large uncertainty in the forecast. Conversely, a narrow range indicates high confidence in the forecast.

2. The next graphic shows the probabilities of exceeding certain snowfall threshold amounts in inches with color curve probabilities from zero to 100 percent in Vermont and Northern New York.



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In this example, clicking on the thumbnail picture with the >= .1" threshold at the top displays an enlarged image of that frame below, for the period ending at 8 AM November 4, 2021.

3. The final product is a text-based exceedance probability table for cities in Western New York:

Snowfall Totals by Location

Experimental - Leave feedback

11/02/2021 0800AM to 11/03/2021 0200PM

What's this?

County: Selected

Location	Snow Amount Potential			Chance of Seeing More Snow Than							
	Low End Snowfall	Expected Snowfall	High End Snowfall	>=0.1"	>=1"	>=2"	>=4"	>=6"	>=8"	>=12"	>=18"
Albion, NY	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%
Batavia, NY	0	0	<1	12%	0%	0%	0%	0%	0%	0%	0%
Buffalo, NY	0	0	0	3%	0%	0%	0%	0%	0%	0%	0%
Canandaigua, NY	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%
Dansville, NY	0	0	<1	35%	0%	0%	0%	0%	0%	0%	0%
Dunkirk, NY	0	0	<1	59%	4%	0%	0%	0%	0%	0%	0%
Fair Haven, NY	0	0	<1	9%	0%	0%	0%	0%	0%	0%	0%
Fulton, NY	0	<1	1	56%	3%	0%	0%	0%	0%	0%	0%
Jamestown, NY	0	2	3	83%	66%	41%	6%	0%	0%	0%	0%
Lockport, NY	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%
Lowville, NY	0	<1	2	54%	25%	6%	0%	0%	0%	0%	0%
Newark, NY	0	0	0	3%	0%	0%	0%	0%	0%	0%	0%
Niagara Falls, NY	0	0	0	0%	0%	0%	0%	0%	0%	0%	0%
Olean, NY	0	1	2	80%	50%	18%	0%	0%	0%	0%	0%
Oswego, NY	0	0	<1	9%	0%	0%	0%	0%	0%	0%	0%
Rochester, NY	0	0	0	3%	0%	0%	0%	0%	0%	0%	0%
Springville, NY	<1	<1	3	100%	76%	33%	2%	0%	0%	0%	0%
Warsaw, NY	0	0	<1	47%	0%	0%	0%	0%	0%	0%	0%
Watertown, NY	0	0	0	2%	0%	0%	0%	0%	0%	0%	0%
Wellsville, NY	0	<1	1	60%	24%	3%	0%	0%	0%	0%	0%

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Selecting a county from the "County:" dropdown menu displays a list of specific cities within that county and shows the probability of snow amounts exceeding a particular threshold for each location.